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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/598,732	Applicant(s) WELKER ET AL.	
	Examiner Krystine Breier	Art Unit 3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 December 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23,25-37,39-47,49 and 51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23,25-37,39-47,49 and 51* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's amendments filed 12/01/2009 have been entered. Claims 48, 50, and 52 have been cancelled. Applicant's amendments to the claims are sufficient to overcome the rejection under 35 U.S.C. 112 of claims 2-7 and 18-22. Accordingly the rejection has been withdrawn.

2. Applicant's arguments filed 12/01/2009 have been fully considered but they are not persuasive.

3. Applicant argues that Zajac does not teach input data comprising operating states from sensors associated with the spread control elements, instead monitoring only the operating status of each streamer. However, it is well known in the art that monitoring the operating status of a streamer includes monitoring the status of the streamer components, which includes the sources, receivers, and spread control elements. Thus since Zajac does collect and use data relating to the operating status of the streamers, it correctly anticipates this limitation of the claim. Furthermore, the applicant defines spread control element operating states as "measurements giving information relevant to a spread model" (pg 6, lines 15-16). Zajac teaches determining the maneuverability of the spread control elements (Col 8, lines 23-25) and the positions of the spread control elements (Col 7, lines 47-49), both of which are measurements from sensors associated with the spread control elements. In the applicant's definition in the specification he states "Examples include winged body orientation, water flow rates over the deflectors, wing angles relative to a wing housing body, rudder angle,

propeller speed, propeller pitch, tow cable tensions, etc." These are merely examples of possible operating state measurements, but the language does not define it as the sole applicable measurements. Other possible measurements which fall within the definition, such as position and maneuverability, may apply.

4. Applicant argues that Zajac does not teach input data comprising survey design data, where survey design data comprises “spread tracks, performance specifications, and survey objectives, wherein the performance specifications are selected from drag and maneuvering characteristics for the vessel, steerable cable devices, steerable source devices, and flotation devices, and winch operating characteristics” (claim 12). As pointed out in the previous office action, Zajac clearly teaches input data comprising survey design data, specifically performance specifications (Col 2, lines 62-64; Col 8, lines 23-25) More specifically it teaches maneuvering characteristics of the vessel (Col 8, lines 23-24) and steerable cable devices (Col 8, line 23).

5. Applicant argues that Zajac does not disclose estimating the positions of sources and receivers, instead merely estimating the position of the streamers. However, it is well known in the art that sources and receivers are disposed at defined positions on the streamers, and that determining the position of the entire length of the streamer, as Zajac does, would necessarily include determining the position of the individual elements of said streamer. Furthermore, it is well known in the art that in order for the survey to be of any use in determining the location of any underground deposits, it is necessary to know the location of the source and receivers with respect to time during the survey. Thus it is obvious that Zajac, which "relates generally to a method and

apparatus for controlling sea borne seismic data acquisition systems" (Col 1, lines 17-19), would have estimated positions of the sources and receivers. Furthermore, the claim states "estimating positions". Approximating the positions of the cable elements, which Zajac does, is within the scope of this limitation. Estimating the positions of the streamer elements is not the same as determining the exact locations of the elements.

6. Applicant argues that Zajac does not teach using the navigation data, the operating states, and the environmental data to estimate positions, specifically because Zajac does not disclose operating states. However, as explained above, Zajac does teach operating states.

7. Applicant argues that Zajac does not teach a transfer function which uses navigation data, the operating states, the environmental data and the survey data as inputs. However, Zajac does teach a master controller which performs the method as described in claim 1, thus it is inherent that the master controller must contain instructions for performing the method. The instructions take the required input data and perform the necessary calculations to arrive at the desired output. Thus, although Zajac does not specifically call for a "transfer function" it clearly teaches one as part of the system of its invention.

8. Applicant argues that Zajac does not teach providing a set of desired coordinate positions of at least two spread control elements. However, Zajac clearly discloses "The actual positions of vessel, streamers, ASPDs [Active Streamer Positioning Devices], and array geometry are compared to desired vessel/streamers/ASPD positions and array geometry" (Col 8, lines 61-64). Furthermore, as shown in Figure 1,

Zajac clearly discloses at least two spread control elements/ASPDs. Thus Zajac does teach providing a set of desired coordinate positions of at least two spread control elements.

9. Applicant argues that Zajac modified by Itria does not teach "controlling the seismic spread by coordinating the positioning of the vessel control elements and the source control elements" or "controlling the seismic spread by coordinating the positioning of the first and second vessel control elements". Zajac teaches coordinating the vessel control elements and the spread control elements (Col 8, lines 45-48), but does not specifically teach source control elements. As shown in the previous office action, Itria teaches spread control elements comprising source control elements (Abstract, lines 1-2; Col 4, lines 7-9). Thus it would have been obvious that the spread control elements which are coordinated by Zajac could include source control elements.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1-3, 6, 9-15, 18, 19, 22, 25, 27-30, and 41 are rejected under 35 U.S.C. 102(a) as being anticipated by Zajac (6691038).

3. With respect to claim 1, Zajac discloses collecting input data from a seismic survey spread having a plurality of spread control elements (Col 4, lines 52-54), a plurality of navigation nodes (Col 7, lines 22-25; Col 9, lines 4-12), and a plurality of

sources (Col 6, lines 40-42) and seismic streamers (Col 4, lines 51-52) containing receivers (hydrophones) (Col 1, lines 34-35), including: navigation data for the navigation nodes (Col 2, lines 5-59), operating states from sensors associated with the spread control elements (Col 5, lines 19-20; Col 8, lines 23-25; Col 7, lines 47-49), environmental data for the survey (Col 2, lines 61-62), and survey design data (Col 2, lines 62-64), estimating positions of the sources and receivers using the navigation data, the operating states, and the environmental data (Col 5, lines 5-7; Col 8, lines 29-31); determining optimum tracks for the sources and receivers using the estimated positions and a portion of the input data that includes at least the survey design data (Col 5, line 7, Col 8, lines 7-9); and calculating drive commands for at least two of the spread control elements using the determined optimum tracks (Col 5, lines 8-10).

4. With respect to claim 2, it is inherent that the master controller (Col 5, line 11) of Zajac contains instructions for performing the steps which it performs in the method of claim 1 using the navigation data (Col 8, lines 29-30), the operating states (Col 5, lines 19-22), the environmental data (Col 8, lines 31-32) and the survey design data (Col 8, lines 23-25, 33) as inputs. Thus the estimating, determining, and calculating steps are performed by this "transfer function".

5. With respect to claim 3, Zajac discloses the positions are estimated according to a spread model within the transform function, and the optimum tracks are input to the spread model for calculation of the drive commands (Col 9, lines 41-42).

6. With respect to 6, Zajac discloses the predicted residuals are use to estimate error states for sensors used to collect the environmental data (Col 5, lines 19-20; Col 10, lines 56-64).

7. With respect to claim 9, Zajac discloses the drive commands include commands for controlling at least one of the vessel propeller, vessel thruster, spread component steering devices Col 8, lines 64-67), and the vessel cable winches.

8. With respect to claim 10, Zajac discloses the sensors associated with the spread control elements include one or more sensor types of tension, water flow rate (Col 9, lines 34-36), inclination, orientation, acceleration, velocity, and position (Col 9, lines 10-12).

9. With respect to claim 11, Zajac discloses the collected environmental data includes one or more data types of current (Col 2, line 61), salinity (Col 2, lines 61-62), temperature (Col 2, line 61), pressure, speed of sound, wave height, wave frequency, wind speed (Col 2, line 61), and wind direction.

10. With respect to claim 12, Zajac discloses the survey design data is selected from spread tracks, performance specifications (Col 2, lines 62-64), and survey objectives, wherein the performance specifications are selected from drag and maneuvering characteristics for the vessel (Col 2, line 64), steerable cable devices (Col 8, lines 23-25), steerable source devices, and deflectors, drag characteristics for the towed cables (Col 2, lines 62-64; Col 8, lines 23-25), sources, and floatation devices, and winch operating characteristics.

11. With respect to claim 13, Zajac discloses the survey design data includes one or more data types of area, depth, area rotation or shooting orientation, line coordinates, source and receiver positions (Col 2, lines 55-59), required coverage, local constraints, optimizing factors and historical data; and the collected input data includes one or more data types of pre-survey, operator input (Col 8, line 9), present survey, near-real time, real-time survey, and simulated survey.

12. With respect to claim 14, Zajac discloses the operator input data includes spread parameter settings (Col 8, lines 7-9) and environmental data, and wherein the pre-survey data includes environmental sensor data (Col 2, 61-66).

13. With respect to claim 15, Zajac discloses the real-time survey data includes one or more data types of cable tension, water flow rate (Col 9, lines 34-36), inclination, orientation, acceleration, velocity, position (Col 9, lines 10-12), spread control element setting, environmental data, seismic signal and noise data, and operator input.

14. With respect to claims 18 and 22, Zajac discloses the spread model is a hydrodynamic force model of the spread components, a pure stochastic model of the spread components, employing one of the L-norm fitting criteria, or a neural network (Col 9, lines 41-42).

15. With respect to claim 19, Zajac discloses the force model contains marine current data (Col 9, lines 41-43).

16. With respect to claim 25, Zajac discloses towing a plurality of seismic survey spread elements generally behind a vessel having one or more spread control elements (Col 4, lines 51-54; Col 6, lines 34-57); providing a first set of desired coordinate

positions of at least two of the spread control elements (Col 5, line 7; Col 8, lines 11-15), independently measuring the a set of actual coordinate positions of the at least two of the spread control elements (Col 4, lines 66-67; Col 8, lines 15-17); calculating a difference between the set of desired coordinate positions and the set of actual coordinate positions to form residuals (Col 5, lines 5-7; Col 8, lines 29-31); and using the residuals as set points in one or more controllers calculating to calculate drive commands for the at least two of the spread control elements (Col 5, line 8; Col 8, lines31-35).

17. With respect to claim 27, Zajac discloses planning a path for the vessel within a constraint corridor that allows steering available in the spread control elements to achieve a target shape and track for the seismic survey spread elements (Col 8, lines 1-38).

18. With respect to claim 28, Zajac discloses estimating optimum tracks for tow points of the spread control elements that provide a cross-line component relative to an optimum track for the spread control elements (Col 8, lines 11-15).

19. With respect to claim 29, Zajac discloses the set of desired coordinate positions is obtained from one or more data types selected from operating states from sensors associated with the spread control elements, environmental data for the survey, and survey design data (Col 8, lines 11-15).

20. With respect to claim 30, Zajac discloses each of the drive commands is used to control at least one of position Col 9, lines24-25), speed (Col 9, lines 24-28), and heading of the vessel.

21. With respect to claim 41, Zajac discloses the spread control elements comprise a vessel control element and a streamer control element in coordination with each other (Col 8, lines 65-66).

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

23. Claims 4, 5, 7, 16, and 53 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Brunet (6618321).

24. Zajac discloses the invention as discussed above. However, it does not disclose the spread model calculates a first set of estimated positions using input that includes at least the operating states and the environmental data, the navigation data includes a second set of estimated positions, and the first and second set of estimated positions are combined with the transform function to produce the estimated source and receiver positions and predicted residuals; the predicted residuals are used to estimate a set of parameters that characterize the spread model, and the spread model parameters are used to calibrate the spread model; the optimum tracks are determined according to a weighting function within the transform function, wherein the weighting function receives as inputs the survey design data and the estimated positions; the simulated survey data includes one or more data types of simulated pre-survey, simulated operator input, simulated current survey, simulated near-real time survey, simulated real-time survey,

and simulated environmental data; the positions are estimated according to a spread model used to predict residuals, and further comprising: using the predicted residuals to estimate one or more parameters of the spread model; and feeding the parameters back into the spread model.

25. Brunet teaches the spread model calculates a first set of estimated positions using input that includes at least the operating states and the environmental data (Col 4, lines 39-41), the navigation data includes a second set of estimated positions (Col 4, lines 26-28), and the first and second set of estimated positions are combined with the transform function to produce the estimated source and receiver positions and predicted residuals; the predicted residuals are used to estimate a set of parameters that characterize the spread model, and the spread model parameters are used to calibrate the spread model (Col 5, lines 17-21); the optimum tracks are determined according to a weighting function within the transform function, wherein the weighting function receives as inputs the survey design data and the estimated positions (Col 4, lines 45-55; Col 5, lines 11-13); the simulated survey data includes one or more data types of simulated pre-survey, simulated operator input, simulated current survey, simulated near-real time survey, simulated real-time survey, and simulated environmental data (Col 2, lines 49-52); the positions are estimated according to a spread model used to predict residuals, and further comprising: using the predicted residuals to estimate one or more parameters of the spread model (Col 5, lines 17-21); and feeding the parameters back into the spread model (Col 4, lines 42-55).

26. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the predicted residuals of Brunet since such a modification would have led to more accurate positioning results. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the weighted optimum track determination of Brunet since such a modification would have ensured that the most important factors were those which were taken most strongly into account in the path determination. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the simulated data of Brunet since such a modification would have given a good prediction of environmental factors to take into account for more accurate positioning of the streamers.

27. Claim 8 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Saban (5448233).

28. Zajac as modified teaches the invention as discussed above. However, it does not teach validating the calculated drive commands and delivering the validated drive commands to the spread control elements, whereby a desirable survey objective may be attained.

29. Saban teaches validating and subsequently executing drive commands (Col 4, lines 21-24).

30. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the command validation of Saban, since such a modification would have ensured collisions with obstacles or other components.

31. Claims 17 and 23 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Riley (7446706).

32. With respect to claim 23, Zajac teaches a seismic survey spread having a plurality of spread control elements (Col 4, lines 51-54; Col 6, lines 34-57), a plurality of navigation nodes (Col 7, lines 22-25; Col 9, lines 4-12), and a plurality of sources (Col 6, lines 40-42) and seismic streamers (Col 4, lines 51-52) containing receivers (hydrophones) (Col 1, lines 34-35), a database for receiving input data (Col 4, lines 63-64; Col 8, lines 29-31).

33. However, it does not have computer readable instructions for performing the method as taught in claim 1. Riley teaches a computer readable medium having computer executable instructions (Col 13, lines 42-67; Col 14, lines 1-12).

34. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the computer readable medium of Riley since such a modification would have allowed the method to be portable and executable on multiple systems.

35. With respect to claim 17, Zajac as modified teaches the invention as discussed above. However, it does not teach the collected input data further includes raw seismic sensor data, and using the raw seismic sensor data to produce quality indicators for the estimated positions, the quality indicators selected from binning datasets, absolute noise data, signal-to-noise ratios, and seismic signal frequency content.

36. Riley teaches the collected input data further includes raw seismic sensor data, and using the raw seismic sensor data to produce quality indicators for the estimated

positions (Col 5, lines 61-66), the quality indicators selected from binning datasets, absolute noise data, signal-to-noise ratios, and seismic signal frequency content (Col 6, lines 3-67; Col 7, lines 1-15).

37. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the quality indicators of Riley since such a modification would have provided data for error estimates in the processing of the data.

38. Claim 20 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Gikas et al, "Reliability analysis in dynamic systems: Implications for positioning marine seismic networks", *Geophysics*, Vol. 64, No. 4, July-August 1999, pgs. 1014-1022.

39. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread model is a pure stochastic model of the spread components (pg 1018, Col 1, lines 6-28).

40. Gikas teaches the spread model is a pure stochastic model of the spread components (pg 1018, Col 1, lines 6-28).

41. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the stochastic spread model of Gikas since such a modification would have given easily understandable measures of both internal and external reliability and can be used in both the design of seismic spread and in real time to ensure that appropriate quality control is possible.

42. Claim 21 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Armstrong et al., “The best parameter subset using the Chebychev curve fitting criterion”, *Mathematical Programming,* Vol. 27, No. 1, September 1983, pages 64-74.

43. Zajac as modified teaches the invention as discussed above. However, it does not teach the spread model employs one of the L-norm fitting criteria.

44. Armstrong teaches that the L-norm fitting criterion is a widely studied curve fitting method (Abstract). Since Zajac gives a set of points for the positions of current and legacy data for the optimum spread component positions (Col 8, lines 1-15), it would have been obvious to one of ordinary skill in the art at the time of the invention to modify method of Zajac to use the L-norm fitting criteria of Armstrong to calculate the spread model by fitting the curve to the given points.

45. Claim 26 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Rau (6292436).

46. Zajac as modified teaches the invention as discussed above. However, it does not teach at least one of the controllers uses a PID correction method.

47. Rau teaches the invention as discussed above. However, it does not teach at least one of the controllers uses a PID correction method (Col 30, lines 63-66).

48. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the PID algorithm of Rau since such a modification would have given a good positioning device command algorithm.

49. Claim 31 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Semb (6681710).

50. Zajac as modified teaches the invention as discussed above. However, it does not teach the drive commands include commands for controlling at least one of a vessel propeller, a vessel thruster, a vessel thruster setting, a vessel propeller pitch, a vessel propeller rotation speed, a vessel rudder angle or combinations thereof.

51. Semb teaches the drive commands include commands for controlling at least one of a vessel propeller, a vessel thruster, a vessel thruster setting, a vessel propeller pitch, a vessel propeller rotation speed, a vessel rudder angle or combinations thereof (Col 3, lines 34-36).

52. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel commands of Semb since such a modification would have allowed for more accurate positioning of the survey.

53. Claims 32-37 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Onat (6088298).

54. With regards to claim 32, Zajac teaches towing a plurality of seismic survey sources (Col 6, lines 40-42) and seismic streamers (Col 4, lines 51-52) containing receivers (hydrophones) (Col 1, lines 34-35) generally behind a vessel (Col 4, line 51) having one or more spread control elements (Col 4, lines 52-54); estimating the positions of the sources (Col 5, lines 5-7). However, it does not teach activating only a selected portion of the sources that are at the proximities of the desired cross line positions.

55. Onat teaches activating only a selected portion of the sources that are at the proximities of the desired cross line positions (Col 2, lines 55-56, 61-63).

56. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source activation of Onat since such a modification would have allowed for the modification of the operational center frequency of the transducer array without excessive movement of the array.

57. With regards to claim 37, Zajac teaches a vessel (Col 4, line 51) a plurality of seismic survey sources (Col 6, lines 40-42) and seismic streamers (Col 4, lines 51-52) containing receivers (hydrophones) (Col 1, lines 34-35) generally towed behind the vessel (Col 4, line 51) and having one or more spread control elements (Col 4, lines 52-54); a controller coupled to the seismic survey sources, receivers and the spread control elements (Col 4, lines 56-58), wherein the controller estimates the positions of the sources (Col7, lines 22-25; Col 8, lines 29-31). However, it does not teach activating only a selected portion of the sources that are at the proximities of the desired cross line positions; and a controller that activates the sources.

58. Onat teaches activating only a selected portion of the sources that are at the proximities of the desired cross line positions (Col 2, lines 55-56, 61-63); and a controller that activates the sources (Col 2, line 55).

59. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source activation of Onat since such a modification would have allowed for the modification of the operational center frequency of the transducer array without excessive movement of the array.

60. With regards to claims 33-36, Zajac as modified teaches the invention as discussed above. Furthermore, it teaches seismic streamers containing receivers

(hydrophones) (Col 1, lines 34-35) in a linear array (Fig 1); collecting input data from a seismic survey spread having a plurality of spread control elements (Col 4, lines 52-54), a plurality of navigation nodes (Col 2, lines 5-59; Col 7, lines 22-25; Col 9, lines 4-12), and a plurality of sources (Col 6, lines 40-42) and seismic streamers (Col 4, lines 51-52) containing receivers (hydrophones) (Col 1, lines 34-35); estimating positions of the sources and receivers using the navigation data, the operating states, and the environmental data (Col 5, lines 5-7; Col 8, lines 29-31); determining optimum tracks for the sources and receivers using the estimated positions and a portion of the input data that includes at least the survey design data (Col 5, line 7, Col 8, lines 7-9); and calculating drive commands for at least two of the spread control elements using the determined optimum tracks (Col 5, lines 8-10); and the at least one of the spread control elements is a spread control element for a vessel or a spread control element for a receiver (Col 4, lines 52-54). However, it does not teach the number of the selected portion of the sources is less than the total number of sources; the selected portion of the sources form at least one linear source array parallel to the streamers.

61. Onat teaches the number of the selected portion of the sources is less than the total number of sources (Col 2, lines 55-56, 61-63; Fig 1); the selected portion of the sources form at least one linear source array parallel to the streamers (Col 2, lines 55-56, 61-63; Fig 1).

62. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source activation of Onat since such a

modification would have allowed for the modification of the operational center frequency of the transducer array without excessive movement of the array.

63. Claims 39, 40, 42-47, 49, and 51 are rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Itria (4063213) and Bennet (6590831).

64. With respect to claim 45, Zajac teaches providing a seismic survey spread having one or more vessels (Col 4, line 51) and one or more spread control elements (Col 4, lines 52-54), wherein the spread control elements comprise one or more vessel control elements (Col 4, lines 38-39), and one or more streamer control elements (Col 4, lines 52-54); and controlling the seismic survey spread (Col 8, lines 31-35).

65. However, it does not teach one or more source control elements; and coordinating the positioning of the vessel control elements, the source control elements and the streamer control elements.

66. Itria teaches the spread control elements comprise a source control element (Abstract, lines 1-2; Col 4, lines 7-9).

67. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source control elements of Itria since such a modification would have allowed for accurate positioning of the source elements.

68. Bennet teaches coordinating the positioning of at least two positioning control elements (Col 4, lines 20-58; Fig 1).

69. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic

assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

70. With respect to claim 47, providing a seismic survey spread having one or more vessels (Col 4, line 51) and one or more spread control elements (Col 4, lines 52-54), wherein the spread control elements comprise one or more vessel control elements (Col 4, lines 38-39), one or more streamer control elements (Col 4, lines 52-54).

71. However, it does not teach one or more source control elements, and controlling the seismic survey spread by coordinating the positioning of the vessel control elements and the source control elements.

72. Itria teaches the spread control elements comprise a source control element (Abstract, lines 1-2; Col 4, lines 7-9).

73. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source control elements of Itria since such a modification would have allowed for accurate positioning of the source elements.

74. Bennet teaches coordinating the positioning of at least two positioning control elements (Col 4, lines 20-58; Fig 1).

75. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

76. With respect to claim 49, providing a seismic survey spread having one or more vessels (Col 4, line 51) and one or more spread control elements (Col 4, lines 52-54), wherein the spread control elements comprise one or more vessel control elements (Col 4, lines 38-39), one or more streamer control elements (Col 4, lines 52-54).

77. However, it does not teach one or more source control elements, and controlling the seismic survey spread by coordinating the positioning of the streamer control elements and the source control elements.

78. Itria teaches the spread control elements comprise a source control element (Abstract, lines 1-2; Col 4, lines 7-9).

79. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source control elements of Itria since such a modification would have allowed for accurate positioning of the source elements.

80. Bennet teaches coordinating the positioning of at least two positioning control elements (Col 4, lines 20-58; Fig 1).

81. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

82. With respect to claims 39, 40, 42-44 and 46, Zajac as modified teaches the invention as discussed above. Furthermore, it teaches the spread control elements comprise a vessel control element (Col 4, lines 38-39), and a streamer control element

(Col 4, lines 52-54). However, it does not teach the spread control elements comprise a source control element; the spread control elements comprise at least two control elements in coordination with each other; one of the at least two vessel control elements is associated with a first vessel and another of the at least two vessel control elements is associated with a second vessel.

83. Itria teaches the spread control elements comprise a source control element (Abstract, lines 1-2; Col 4, lines 7-9).

84. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the source control elements of Itria since such a modification would have allowed for accurate positioning of the source elements.

85. Bennet teaches the spread control elements comprise at least two control elements in coordination with each other (Col 4, lines 20-58; Fig 1); one of the at least two vessel control elements is associated with a first vessel and another of the at least two vessel control elements is associated with a second vessel (Col 4, lines 20-58; Fig 1).

86. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

87. Claim 51 is rejected under 35 U.S.C. 103(a) as being obvious over Zajac in view of Bennet (6590831).

88. With respect to claim 51, Zajac teaches providing a seismic survey spread (Col 4, lines 49-57) having a first vessel (Col 4, line 51) having a first vessel control element (Col 4, lines 38-39).

89. However, it does not teach a second vessel and second vessel control element, and controlling the seismic survey by coordinating the first and second vessel control elements.

90. Bennet teaches a second vessel control element associated with a second vessel (Col 4, lines 20-58; Fig 1); coordinating the positioning of at least two positioning control elements (Col 4, lines 20-58; Fig 1).

91. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Zajac with the vessel control elements of Bennet since such a modification would have maximized the safety of the vessels, seismic assets, and crew while also minimizing deviations from desired spatial configuration of the assets.

Conclusion

The prior art which is cited but not relied upon is considered pertinent to applicant's disclosure: 6873571, 5281773, and 7047898.

The references made herein are done so for the convenience of the applicant. They are in no way intended to be limiting. The prior art should be considered in its entirety.

92. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystine Breier whose telephone number is 571-270-7614. The examiner can normally be reached on Monday thru Thursday, 8am-5:30pm EST and alternate Fridays 8am-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. B./
Examiner, Art Unit 3663

/Scott A. Hughes/
Primary Examiner, Art Unit 3663